

## 3.2 – Solving Problems by Solving Equations

Curriculum Outcomes	Related Activities	Page in Text
<ul style="list-style-type: none"> <li>• apply properties of numbers when operating upon expressions and equations</li> <li>• model (with concrete materials and pictorial representations and express the relationships between arithmetic operations and operations on algebraic expressions and equations</li> <li>• interpret solutions to equations based on context</li> </ul>	<p>Investigation and Focuses to have students explore and develop a process by which they can:</p> <ul style="list-style-type: none"> <li>• solve an equation of the form <math>ax + b = c</math></li> <li>• interpret the solution to an equation in the form <math>ax + b = c</math> to ensure it is reasonable in the original problem</li> </ul>	<p>104 108</p>

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### Solving an Equation:

- Requires finding the value of the variable that makes the equation true
- Finding a good representation or model is often the key to solving a problem
- Occurs when a problem involves a relationship that can be written algebraically (with variables)

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## Steps to Solving Equations:

1. Isolate the variable on one side of the equation.

\* if needed:

- Remove brackets by using the distributive property
- When using fractions, multiply by the LCM

2. Divide both sides by the coefficient (multiplier of the variables).

3. Simplify where possible.

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(12.)  $18 - 2x = 6x - 14$

$+2x \quad +2x$

$18 = 8x - 14$

$+14 \quad +14$

$32 = 8x$

$\frac{32}{8} = \frac{8x}{8}$

$x = 4$

$3x^2 + 2y^2 + 9xy + 5x + 22$

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## Example 1:

Steps to Solving Equations With One Unknown	Example 1: $8 + 6x = 50$
1) Isolate the term with the variable on one side of the equation. Where applicable: <ul style="list-style-type: none"> <li>remove brackets using the distributive property</li> <li>multiply by the LCM and simplify fractions</li> </ul>	1) $8 + 6x = 50$ $\xrightarrow{-8}$ $6x = 50 - 8$ $6x = 42$
2) Divide both sides by the coefficient multiplied by the variable.	2) $\frac{6x}{6} = \frac{42}{6}$
3) Simplify where possible.	3) $x = \frac{42}{6}$ $x = 7$

$$\begin{array}{r}
 8 + 6x = 50 \\
 -8 \quad -8 \\
 \hline
 6x = 42 \\
 \div 6 \quad \div 6 \\
 \hline
 x = 7
 \end{array}$$

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## How to verify your answer:

Example 1:  
 $8 + 6x = 50$

Answer-->  $x = 7$

Left side	Right side
$8 + 6x$	50
$8 + 6(7)$	
$8 + 42$	
50	

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## Example 2:

Steps to Solving Equations With One Unknown	Example 2: $8(g - 3) = -25$
1) Isolate the term with the variable on one side of the equation. Where applicable: <ul style="list-style-type: none"> <li>remove brackets using the distributive property</li> <li>multiply by the LCM and simplify fractions</li> </ul>	1) $8(g - 3) = -25$ $8g + (8)(-3) = -25$ $8g - 24 = -25$ $\quad \quad \quad \xrightarrow{+24}$ $8g = -25 + 24$ $8g = -1$
2) Divide both sides by the coefficient multiplied by the variable.	2) $\frac{8g}{8} = \frac{-1}{8}$
3) Simplify where possible.	3) $\frac{8g}{8} = \frac{-1}{8}$ $g = \frac{-1}{8}$

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$$\begin{aligned}
 & \underline{-2(3y - 7) = 56} \\
 & \underline{-6y + 14 = 56} \\
 & \quad \quad \quad \underline{-14 \quad -14} \\
 & \underline{-6y = 42} \\
 & \quad \quad \quad \underline{-6 \quad -6} \\
 & \quad \quad \quad y = -7 \\
 \\
 & \text{j) } \underline{13x + 7(-3x - 1) = -63} \\
 & \underline{13x - 21x - 7 = -63} \\
 & \quad \quad \quad \underline{-8x - 7 = -63} \\
 & \quad \quad \quad \quad \quad \quad \underline{+7 \quad +7} \\
 & \underline{-8x = -56} \quad \quad x = +7 \\
 & \quad \quad \quad \underline{-8 \quad -8}
 \end{aligned}$$

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## How to verify your answer:

Example 2:

$$8(g - 3) = -25$$

Answer-->  $x = \frac{-1}{8}$

Left side	Right side
$8(g - 3)$	$-25$
$8(-1/8 - 3)$	
$-8/8 - 24$	
$-1 - 24$	
$-25$	

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Today:

- Finish and pass in Friday's worksheet
- Watch Solving equation video  
(you may work on your worksheet silently)
- Work on worksheet #2-due tomorrow

Oct 27-2:17 PM

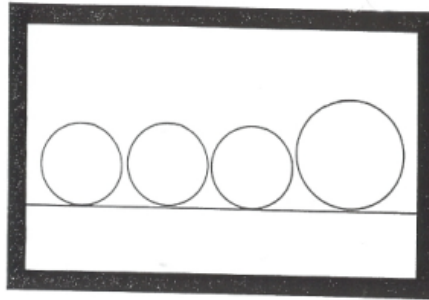
## What Is The Title Of This Picture?

CODED TITLE:

18 -6 6 2 -5 -7 2 -5 -3 6 -5

7 -1 4 -4 -7 8 -5 -3 -7

-13 6 2 1 -3 -1 3 8 4 -13 -7 -2



TO DECODE THE TITLE OF THIS PICTURE:

Solve any equation below and find the solution in the code above. Each time the solution appears, write the letter of that exercise above it. Keep working and you will discover the title.

①  $5(x + 4) = 40$

⑤  $-2(3y - 7) = 56$

③  $6(1 - 4w) = -18$

⑥  $4(2x + 5) - 8 = 36$

②  $2(5 - 3v) + 9v = 28$

⑦  $7 - 3(5t - 10) = 67$

⑨  $-9(6 + u) - 2u = -10$

④  $13x + 7(-3x - 1) = -63$

⑧  $15 - (4m - 5) = 32$

⑩  $-2(-7k + 4) + 9 = -13$

⑪  $-5y - 5(-6 - 2y) = 0$

③  $3(1 + 4n) - 2(5n - 3) = 25$

⑧  $-6(x - 2) + 4(3 - 6x) = -36$

⑤  $5(4 + 2x) - (8x - 12) = 68$

⑦  $-3(-4 - 6y) + 7(-y + 5) = -8$

⑧  $8(2w - 6) + 4(-1 - 5w) = 0$

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## How Do You Buy Something In Mexico?

For any sentence below, circle the member of the given replacement set that is the solution. Find your answer in the code key and notice the letter next to it. Print this letter in the box at the bottom of the page that contains the number of that exercise. Keep working and you will discover the answer to the title question.



- ①  $3y + 9 = 15$  {4, 2, -2}      ⑫  $18 - 2x = 6x - 14$  {4, 3, 2}
- ②  $7 + 4x = -1$  {3, -3, -2}      ⑬  $6y - 10 = y + 25$  {7, -3, -1}
- ③  $26 - 8t = -30$  {5, 7, 8}      ⑭  $-2t + 7 = 5t - 56$  {1, 5, 9}
- ④  $11 = 6x - 13$  {4, -2, 1}      ⑮  $8 + 15a = 11a$  {2, -2, 3}
- ⑤  $-7n + 5 = 12$  {9, -3, -1}      ⑯  $5 - y = -4y + 29$  {-8, 8, -4}
- ⑥  $16 - 4x = 24$  {2, -2, 7}      ⑰  $2 - 7k = -k + 20$  {6, -6, -3}
- ⑦  $-75 = -25 + 5d$  {5, -10, 10}      ⑱  $3n + 3 = 2n - 4$  {-7, 1, -5}
- ⑧  $-8 = -2y - 18$  {4, -4, -5}      ⑲  $-8x + 1 = 81 + 2x$  {-4, -8, 8}
- ⑨  $9u - 16 = 20$  {4, 3, 2}      ⑳  $-12m = 5m + 68$  {5, -9, -4}
- ⑩  $-12 = 12r + 24$  {-1, -2, -3}      ㉑  $9x - 27 = 12 - 4x$  {4, 3, -3}
- ⑪  $52 + 21p = 10$  {-1, -2, 2}      ㉒  $-5 + 7y = 43 - y$  {6, 1, 10}

13	2	12	22	1	20	11	19	4	16	7
5	10	18	3	15	9	6	21	17	14	8

CODE KEY	
-10	H
-9	K
-8	M
-7	D
-6	G
-5	T
-4	S
-3	N
-2	O
-1	A
1	R
2	E
3	W
4	U
5	L
6	P
7	Y
8	C
9	I
10	V

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## Classwork/Homework

Page 106 #3, 4a-h

Note: for #4 just solve each equation

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## Equations with Fractions

**Step #1:** Clear all fractions by multiplying through by a number that all the denominators will divide into. Everything, including the non fraction terms must be multiplied by this number.

**Step #2:** Get like terms together by doing the opposite operation already being done. Get all the variables on one side and all the numbers on the other.

**Step #3:** Divide by the coefficient to get the variable alone.

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### Example 3:

Example 3:

$$\frac{1}{3}(5x-1) + \frac{3}{2}(x+7) = 20$$

$$6 \cdot \left( \frac{5x}{3} - \frac{1}{3} + \frac{3x}{2} + \frac{21}{2} \right) = (20) \cdot 6$$

(3 and 2 can go into 6, so multiply all terms by 6)

$$\frac{30x}{3} - \frac{6}{3} + \frac{18x}{2} + \frac{126}{2} = 120$$

Simplify

$$10x - 2 + 9x + 63 = 120$$

Combine like terms

$$19x + 61 = 120$$
$$-61 \quad -61$$

subtract 61 from both sides

$$\frac{19}{19}x = \frac{59}{19}$$

Divide by 19 on both sides

$$x = \frac{59}{19} = 3\frac{2}{19}$$

Reduce the fraction.

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Solve each of the following:

- $3x + 2 = 8$
- $4 = 2(x-5)$
- $3x - 7 = -1$
- $4x + 3.5 = 7.5$
- $3(m - 2/3) = 25$
- $\frac{3}{5}(x+1) - \frac{1}{5}(x+2) = 15$
- $\frac{2}{3}x + \frac{1}{4} = \frac{3}{5}$

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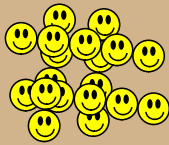


## Classwork/Homework

Page 107 #8 Solve each equation

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Pg. 106



a, b, c, d, i



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Pg. 106 #4. a, b, c, d, i

(a)  $2(m+3)=22$   $\frac{2m}{2} = \frac{16}{2}$   
 $2m+6=22$   $m=8$

(b)  $3y-4=2$   $\frac{3y}{3} = \frac{6}{3}$   $y=2$

(c)  $5-x=9$   $\frac{-1x}{-1} = \frac{4}{-1}$   $x=4$

(d)  $-4-5x=15$   $x = -\frac{19}{5} = -3\frac{4}{5}$   
 $-5x=19$   $x=-3.8$

(i)  $\frac{2}{3}(x-2) + \frac{1}{2}(x-2) = 1$   
 $\frac{2x}{3} - \frac{4}{3} + \frac{1x}{2} - \frac{1}{2} = 1$   
 $\Rightarrow 4x - 8 + 3x - 6 = 6$   
 $\Rightarrow 7x - 14 = 6$   
 $\frac{7x}{7} = \frac{20}{7}$   $x = \frac{20}{7} = 2\frac{6}{7}$   $2.9$

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## Practice:

1.  $3(m - \frac{2}{3}) = 25$

2.  $\frac{3}{5}(x+1) - \frac{1}{5}(x+2) = 15$

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# Steps for Solving Problems using an Equation

- Step 1: Identify the variables
- Step 2: Let letters represent each variable (write your statement "let  $x = \dots$ ")
- Step 3: Write the equation using the variables
- Step 4: Put in known variable
- Step 5: Do the math!!! Put the unknown variable all by itself.

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## Focus D: Solving Problems Pg. 108

### Question:

The student council rented a bus to take fans to the basketball championship game.

- The basic cost to rent the bus is \$300
- The driver charges an additional \$1.50 per kilometer.
- The total bill was \$438

How far did the bus travel?

### Solution:

1. Set up an equation:

Let " $d$ " represent the number of kilometers traveled.

total cost = initial value + \$1.50 for each additional kilometer

2. Fill in and solve the equation:

$$y = 300 + 1.50d$$

$$438 = 300 + 1.50d$$

Subtract 300 from each side

$$138 = 1.50d$$

Divide by 1.50

$$92 = d$$

3. Check your answer:

Left-side

$$438$$

Right-side

$$300 + 1.50d$$

$$= 300 + 1.50(92)$$

$$= 438$$

$d = 92$  is correct!

The bus traveled 92 kilometers.

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### Classwork/Homework

- Page 109 #11, 12, 13
- For each of the questions do the following:
  - write the equation that models the situation
  - state what quantity each variable represents
  - solve the equation
  - verify each solution

pg. 109

⑪ a)  $C = 5.00 + 0.01x$   
 $x$  represents # of pages

$$9.80 = 5.00 + 0.01x$$

$$\begin{array}{r} -5.00 \\ 9.80 - 5.00 = 0.01x \\ 4.80 = 0.01x \end{array}$$

$$\frac{4.80}{0.01} = \frac{0.01x}{0.01}$$

$$480 = x$$

The book has 480 pages

⑪ b)  $C = 1.00 + 0.04x$   
 $C = 1.00 + 0.04(480)$

$$C = 1.00 + 19.20$$

$$C = 20.20$$

The cost would be \$20.20

⑪ c) choice one is better  
 why? \$9.80 is better than \$20.20.

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⑫  $500 = 80 + 30x$   
 $x$  represents the # of days  
 $\begin{array}{r} -80 \\ 500 - 80 = 30x \\ 420 = 30x \end{array}$   
 $\frac{420}{30} = \frac{30x}{30}$   
 $x = 14$

Tickets were on sale  
 for 14 days.

⑬ Opt. 1  $\rightarrow C = 5.00 + 0.04x$   
 Opt. 2  $\rightarrow C = 1.00 + 0.20x$

⑭  $40 = 5.00 + 0.04x$        $40 = 1.00 + 0.20x$   
 $\begin{array}{r} -5.00 \\ 40 - 5.00 = 0.04x \\ 35 = 0.04x \end{array}$        $\begin{array}{r} -1.00 \\ 40 - 1.00 = 0.20x \\ 39 = 0.20x \end{array}$   
 $\frac{35}{0.04} = \frac{0.04x}{0.04}$        $\frac{39}{0.20} = \frac{0.20x}{0.20}$   
 $x = 875$        $x = 195$

Option 1

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Homework word problems.doc

Practice Word Problems.doc

Equation Riddles.doc

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## Extra Practice Worksheets

Equations worksheet.doc

Solving equations worksheet 2.doc

Solving equations worksheet 3.doc

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## Attachments

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Equations.doc

Equation Riddles.doc

Solving for an Unknown 1.doc

Solving for an Unknown 2.doc

Word Problems Practice.doc

Writing word problems.doc

Oct 29-332 PM.galleryitem